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The Genus Chaetogaster Baer (Oligochaeta, Naididae)

V.P. Semernoi, Yaroslav State University

Scientists have hitherto known three species of the genus /28*
Chaetogaster in [Lake] Baikal:

a) Ch. crystallinus Vejd. /Michaelsen, 1903/,

b) Ch. (of the type) diastrophus (Gruith.) /Gavrilov, 1950, identification by D.A. Lastochkin/;

c) Ch. diaphanus (Gruith)/Michaelsen, 1902 and 1903; Sokol'skaya, 1962/. Investigators have found Ch. diastrophus, Ch. langi Bretsch. and Ch. crystallinus in Lake Baikal shore waters /Malevich, 1950/. N.L. Sokol'skaya /1962/ considers the indication only of Ch. diaphanus reliable.

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*Numbers in the right-hand margin indicate the corresponding pages in the original.

[1]The author wishes to express his gratitude to G.F. Mazepova for the opportunity to participate in the work of the expedition.

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In July 1982 we collected oligochaetes on the littoral and sublittoral of northern Lake Baikal and in Maloe More[1] Sound. We took samples with a bottom trawl from a ship and scanned the washed-off soil partially or completely under an MBS-1 binocular microscope. This enabled us to allow for small forms of naids, including chaetogasters up to 2 mm long. After processing the collected material, we isolated over 10 forms of the genus Chaetogaster unknown for [Lake] Baikal; of these we identified nine species and one subspecies as new to science.

When we describe the species, to save space we shall not indicate the features characteristic of the genus. Since the chaetogasters have no setae other than ventral ones, we shall not use the word "ventral". We have not described the reproductive systems of species whose specimens were found in a sexually immature state. The features of the naid reproductive system are, we feel, of minor taxonomic importance and in practical work are rarely used to identify species, so we consider it feasible to describe the species apart from /29
the reproductive system. Taking into account the small sizes of the Lake Baikal chaetogasters and the impracticability of preparing series of sections for studying their internal structure, we used the method of preparing clarified specimens with staining after Hiems-Romanovskii [spelling approximate]: a weak aqueous stain solution - 96° alcohol - absolute alcohol - xylene - balsam or gum dammar. We prepared the drawings using an RA-1 drawing instrument.

Chaetogaster diaphanus (Gruith.) (Fig. 1)

The prostomium is not distinct. A notch occurs along the dorsal margin of the mouth funnel. The setae of segment II number 8 to 11 in each tuft; they are 147 to 255 μ long, with the upper tooth 1.5 times

thinner and longer than the lower one. The setae of segments VI-XII number 7 in each tuft; they are 137 to 235 μ long, with teeth of almost equal thickness, the upper tooth being almost twice as long as the lower one.

Found in a small lake on Cape Ulan-Khyn in Maloe More Sound.

Not found on the open Lake Baikal littoral. Found at the head of Chivyrkuiskii Bay at a depth of 1.5 m. Common in water bodies of the Baikal and Transbaikal regions /Semernoi, 1972/.

Chaetogaster diaphanus (Gruith.)

Litoralis Semernoy, ssp. n. (Fig. 2)

Length 1.5 to 2 mm; number of segments: 14 to 16.

Prostomium not distinct.

The setae of segment II number 7 in each tuft; they are 130 to 153 μ long, with an upper tooth twice as long as the lower tooth.

The setae of segments VI-XVI number 8 or 9 in each tuft; they are 88 to 106 μ long and are much thinner than in segment II, with the same ratio of teeth.

The setae of segment VI of sexually mature worms are partially replaced by penial setae numbering 2 or 3 with hamately recurved edentate distal ends. They are 100 μ long. Up to 7 ordinary setae occur in a tuft together with the penial setae.

The spermatheca has an oval ampulla with a glandular diverticulum on its apex, and a thin, slightly convoluted efferent part. The ampulla of the atrium is small and round; the penis is in a small penial bursa.

Holotype No. 433558. Zoological Institute, Academy of Sciences USSR.

Location. Maloe More Sound, opposite Kurma, depth 25 m, sand.

Occurrence. Everywhere on the open littoral at depths of up to 25 m. We note with interest that in the bays and inlets of Maloe More Sound and in Chivyrkuiskii and Barguzinskii Bays this subspecies is not found at depths of up to 10 m, but appears at a depth of 25 m, i.e., in areas where the Lake Baikal [water] system is the most pronounced. On /30

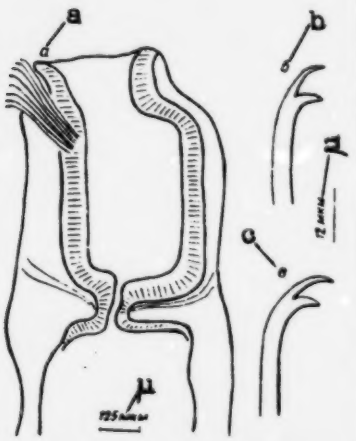

Рис. 1. Chaetogaster diaphanus Gruith.
а – общий вид червя; б–в – дистальные концы щетинок II и постларвальных сегментов.

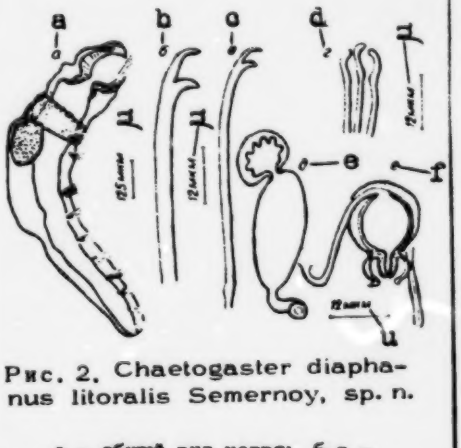

Рис. 2. Chaetogaster diaphanus litoralis Semernoy, sp. n.
а – общий вид червя; б–в – дистальные концы щетинок II и постларвальных сегментов; г – дистальные концы пениальных щетинок; д – семяприемник, е – мужской гонодукт.

Fig. 1 - Chaetogaster diaphanus Gruith. a - overall view of worm; b-c - distal ends of setae of segment II and postlarval segments

Fig. 2 - Chaetogaster diaphanus litoralis Semernoy, sp. n. a - overall view of worm; b-c - distal ends of setae on segment II and postlarval segments; d - distal ends of penial setae; e - spermatheca; f - male gonoduct.

the open littoral it occurs at a depth of 3 m in encrusting organisms on stones.

In the shape of the distal parts of its setae and in the presence of the penis in a small penial bursa the morph that we have described represents a miniature Ch. diaphanus. N.L. Sokol'skaya /1962/ probably dealt with it. We have made it into a subspecies primarily on the basis of an ecological and geographic feature: the typical Ch. diaphanus does not occur in open Lake Baikal. In addition, we see certain differences in the ratio of the length of the upper and lower teeth of the setae on segment II.

Chaetogaster paucus Semernoy, sp. n. (Fig. 3)

Length 0.65-1.1 μ; number of segments 9-11.

The prostomium is rudimentary but visible and is in the form of a ridge.

The setae of segment II number 12 to 14 in each tuft; they are 147 to 177 μ long, with an upper tooth that is 1.5 times longer and thinner than the lower tooth. The setae of segments VI-XI number 8 or 9 in each tuft; they are 88 to 118 μ long, with a rudimentary lower tooth in the form of a thin paleola barely discernible at high magnifications with immersion.

Holotype No. 43359. Zoological Institute of the Academy of Sciences USSR.

Location. Maloe More Sound, entrance from noth, middle of sound, depth 50 m, sand, 27 July 1982. /31

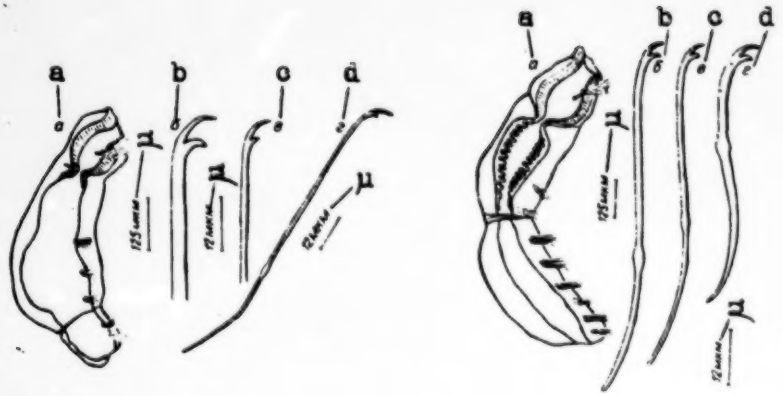

Рис. 3. Chaetogaster paucus Semernoy, sp. n.
а – общий вид червя; б–в – дистальные концы щетинок II и постларвальных сегментов; г – щетинка VII сегмента.

Рис. 4. Chaetogaster grandisetosus Semernoy, sp. n.
а – общий вид червя; б–в – щетинки II и постларвальных сегментов; г – крупная щетинка (II типа).

Fig. 3 – Chaetogaster paucus Semernoy, sp. n. a – overall view of worm; b-c – distal ends of setae of segment II and postlarval segments; d – seta of segment VII.

Fig. 4 – Chaetogaster grandisetosus Semernoy, sp. n. a – overall view of worm; b-c – setae of segment II and postlarval segments; d – large seta (type II)

Occurrence. Maloe More Sound, depth 0.5-50 m; eastern shore, Cape Kabanii, depth 3.0 m. Inhabits encrusting organisms on stones and on sand with detritus.

This species probably most closely resembles Ch. crystallinus Vejd., especially since the latter has been indicated for [Lake] Baikal /Michaelsen, 1903/ and the Lake Baikal region /Malevich, 1950/.

N.L. Sokol'skaya /1962/ considers Michaelsen's data to be inaccurate. Michaelsen's material may have included worms resembling the ones that we found, and he may have mistakenly identified them with Ch. crystallinus.

The marked difference in the length of the setae of segment II and in the shape, number and sizes of the setae of the postlarval segments, however, significantly differentiates the worms that we found from Ch. crystallinus.

Chaetogaster grandisetosus Semernoy, sp. n. (Fig. 4)

Length 0.42-0.8 mm; number of segments 10-13.

The prostomium is rudimentary but visible.

The setae in the tufts are bicuspid and of two types: the thin basal setae and the thicker accessory setae (1 of the latter in each tuft). The tufts of segment II can contain 5 or 6 basal setae 77 to

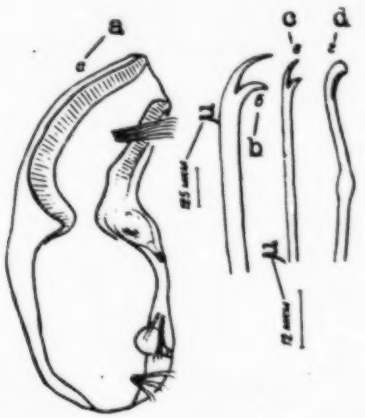

Рис. 5. Chaetogaster cannibalus Semernoy, sp. n.
а – общий вид червя; б–в – дистальные концы щетинок II и постларвальных сегментов; г–пенициальная щетинка.

Fig. 5 - Chaetogaster cannibalus Semernoy, sp. n. a - overall view of the worm; b-c - distal ends of setae of segment II and postlarval segments; d - penial seta. /32

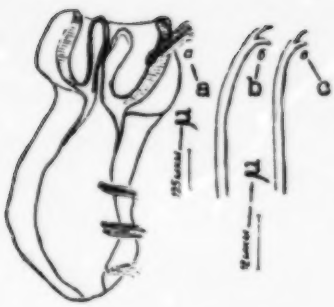

Рис. 6. Chaetogaster ignotus Semernoy, sp. n.
а – общий вид червя; б–в – дистальные концы щетинок II и постларвальных сегментов.

Fig. 6 – Chaetogaster ignotus Semernoy, sp. n. a – overall view of worm; b–c – distal ends of setae of segment II and postlarval segments.

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118 μ long, with the upper tooth longer than the lower one, and 1 accessory seta 53 to 100 [μ] long and like the basal setae, but 1.5 times thicker. The tufts beginning with segment VI can contain 6 to 8 first-type setae 77 to 88 μ long, and 1 second-type seta 45 to 65 μ long.

Holotype No. 43360. Zoological Institute of the Academy of Sciences USSR.

Location. Lake Baikal, Maloe More Sound, opposite Kurma; depth 20 m, sand, stonewort [Chara], 29 July 1982.

Occurrence. Maloe More Sound, depth 5–20 m, sand and stones; southern Lake Baikal, around the city of Baikal'sk, at the shore.

In the larger worms all the setae in segment II resemble type II setae in the succeeding segments. In the worms from the southern Baikal littoral large setae occur only in the tufts of the postlarval segments.

Chaetogaster cannibalus Semernoy, sp. n. (Fig. 5)

Length 1.2 mm; number of segments of separate individual and of first zooid 6-8.

The prostomium is not distinct. The pharynx is thick and muscular; segments II and III comprise almost half the body.

The setae of segment II are fairly large, 177 to 187 μ long; they occur 8 to 10 in a tuft, with the upper tooth 1.5 times longer than the lower one.

The setae of segments VI-VIII are thinner and 130 μ long; they number 6 to 8 in each tuft, with the upper tooth twice as long as the lower one.

The penial setae with an obtuse hamate distal end 175 μ long.

The spermatheca is oval and 130 μ long; the efferent part is 53 μ long and 14 μ in diameter. The ampulla of the atrium is 59 μ in diameter; the ejaculatory duct is 28 μ long, 28 μ in diameter and enclosed in a small penial bursa.

The species has been given its name owing to the discovery of chaetogasters (Ch. intermedius) in its intestine.

Holotype No. 43361. Zoological Institute of the Academy of Sciences USSR.

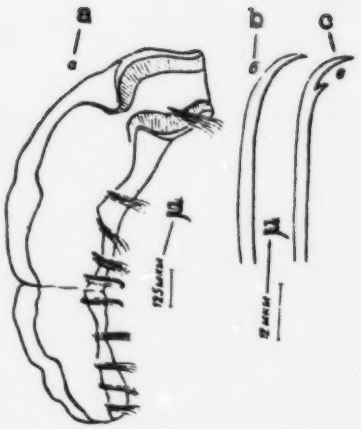

Рис. 7. Chaetogaster dissetosus Semernoy, sp. n.
а – общий вид червя; б–в – дистальные концы щетинок II и постларвальных сегментов.

Fig. 7 - Chaetogaster dissetosus Semernoy, sp. n. a - overall view of worm; b-c - distal ends of setae of segment II and postlarval segments. /33

Location. [Lake] Baikal, Maloe More Sound, Cape Otto-Khushun, depth 10 m, sand, stones, 26 July 1982.

Occurrence. Maloe More Sound, littoral, depth 1-25 m, in encrusting organisms on stones, and on sand among stonewort.

An interesting feature of the setae is that they are like straws: they are hollow inside and flat where bent.

Chaetogaster ignotus Semernoy, sp. n. (Fig. 6)

Length 0.85 mm, number of segments 8-13.

The prostomium is not distinct.

The integumental epithelium with small epidermal papillae (fairly long on segments III-IV), to which soil particles adhere.

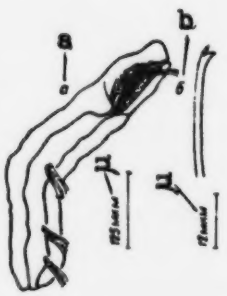

Рис. 8. Chaetogaster crocodilus Semernoy, sp. n.
а – общий вид червя; б – дистальный конец щетинки.

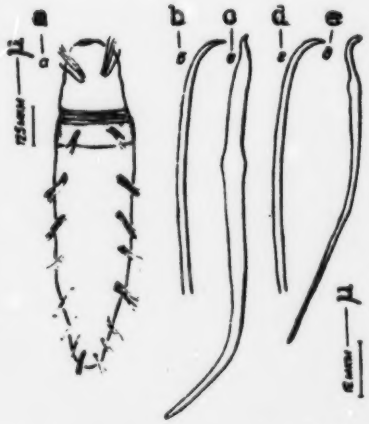

Рис. 9. Chaetogaster intermedius Akinschina (in lit.).
а – общий вид червя; б, г – дистальные концы щетинок II и постларвальных сегментов; в – утолщенная щетинка (II типа) II сегмента; д – пенниальная щетинка.

Fig. 8 – Chaetogaster crocodilus Semernoy, sp. n. a – overall view of worm; b – distal end of seta. /34

Fig. 9 – Chaetogaster intermedius Akinschina (in lit.). a – overall view of worm; b and d – distal ends of setae of segment II and postlarval segments; c – thickened seta (type II) of segment II; e – penial seta.

The setae are homotypic and bicuspid, with teeth of equal length, or the upper one thinner and slightly longer than the lower one. Segment II contains 7 setae 130 to 177 μ long. The setae of the postlarval segments number 6 to 9 in a tuft and are 94 to 106 μ long.

Holotype No. 43362, Zoological Institute, Academy of Sciences USSR.

Location. Chivyrkuiskii Bay, depth 25 m, sand, detritus, 17 July 1982.

Occurrence. Chivyrkuiskii Bay, depth 25 m, sand, detritus; Maloe More Sound, depth 50 m, silt.

The distinctive feature of the species lies in the shape of the distal end of the setae: the teeth are of almost the same length.

Specimens from Maloe More Sound have in segment II separate setae with the upper tooth slightly shorter than the lower one.

Chaetogaster dissetosus Semernoy, sp. n. (Fig. 7)

Length 0.65-0.83 mm, number of segments 10-15.

Prostomium not distinct.

The ventral setae are of two types: edentate in segment II and bicuspid with a rudimentary lower tooth in the postlarval segments.

The tufts of segment II each contain 7 edentate setae 106 to 142 μ long. Segments VI-XV contain 6 or 7 bicuspid setae 90 to 124 μ long.

Holotype No. 43363. Zoological Institute of the Academy of Sciences USSR.

Location. Maloe More Sound, Cape Otto-Khushun, depth 10 m, 26 July 1982.

Occurrence. Maloe More Sound, depth 10 m, sand and stones; Chivyrkuiskii Bay, depth 25 m, sand and detritus.

The distinguishing feature of the species can be seen in the two types of setae differing in shape.

Chaetogaster crocodilus Semernoy, sp. n. (Fig. 8)

Length 0.45 mm, number of segments 8 or 9.

The prostomium is clearly distinct. A narrow oral duct leads to the cavity of the pharynx with a thick, toothed chitinoid lining.

The integumental epithelium with small epidermal papillae. /35

The setae are homotypic and bicuspid, with a thinner and shorter upper tooth. Segment II contains 3 setae 52 μ long, while segments VI-IX have 6 setae 52 μ long.

Holotype No. 43364. Zoological Institute of the Academy of Sciences USSR.

Location. Maloe More Sound, Cape Otto-Khushun, depth 5 m, encrusting organisms on stones. 26 July 1982.

Worms of this species have also been found forming part of the interstitial fauna in moist sand 0.5 m from the shoreline on Ol'khon Island, to the right of the entrance into the Ol'khonskie Vorota ["Ol'khon Gates"] Strait on the [Lake] Baikal side. Some of them had a typical pharynx, and the others, a weakly developed chitinoid lining and numerous small denticles.

Occurrence. The Maloe More Sound littoral and supralittoral and possibly those of the Ol'khon shore, Lake Baikal.

It probably leads a predatory mode of life on the littoral: remains of rotifers are visible in the intestine. In moist sand it feeds on detritus and apparently protozoans.

Chaetogaster intermedius Akinschina (in. lit) (Fig. 9)

Length 0.65-0.83 mm; number of segments 8-13.

The prostomium is rudimentary and only slightly visible.

The setae are of different types. Segment II contains 5 or 6 thin edentate setae 88 to 124 μ long, and in each tuft one thickened seta 83 to 88 μ long, with a simply acuminate, distorted distal tip and a distal nodule.

The setae of the postlarval segments are bicuspid, with a thin, rudimentary lower tooth, number 4 in each tuft and 83 to 100 μ long. Sexually mature worms each have 2 penial setae 70 μ long in segment VI, with an edentate hamately recurved distal end and a distal nodule.

The clitellum is in the form of a small egg cocoon enveloping part of segment V and all of segment VI.

The seminal funnel is directed inside the seminal sac; the vas deferens is short, thin and covered with a prostate cell layer that is dense yet not thick; it discharges into the apex of the atrium ampulla;

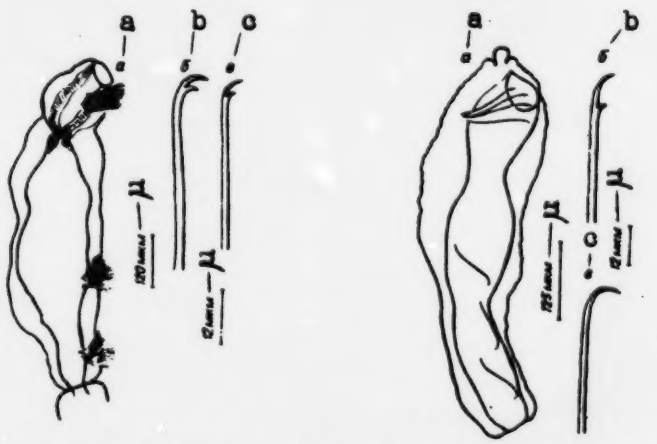

Рис. 10. Chaetogaster multisetosus Semernoy, sp. n.
а – общий вид червя; б–в – дистальные концы щетинок II и постларвальных сегментов.

Рис. 11. Chaetogaster gavrilovi Semernoy, sp. n.
а – общий вид червя; б – в – дистальные концы щетинок II и постларвальных сегментов.

Fig. 10 – Chaetogaster multisetosus Semernoy, sp. n. a – overall view of worm; b–c – distal ends of setae of segment II and postlarval segments.

Fig. 11 – Chaetogaster gavrilovi Semernoy, sp. n. a – overall view of worm; b–c – distal ends of setae of segment II and postlarval segments.

it is oval or globular and 33-37 μ in diameter; the efferent part is short: 18 μ. The ampulla of the spermatheca is rounded and 28-35 μ in diameter; the efferent part is 18 μ long.

Holotype No. 43365. Zoological Institute of the Academy of Sciences USSR.

Location. Maloe More Sound opposite Kurma, depth 25 m, sand, stonewort, 29 July 1982.

Occurrence. The Baikal littoral from the shoreline to 25 m; on different soils and in encrusting organisms on stones; Angara River, Bratsk Reservoir. It is one of the most frequently occurring species and common in Chivyrkuiskii Bay at a depth of 25 m.

Investigators find specimens in which the postlarval segments contain, along with bicuspid setae, edentate setae resembling the setae /36
of segment II.

We should consider as the most characteristic feature of the species the presence in segment II of a thickened, simply acuminate seta along with simple edentate setae.

Chaetogaster multisetosus Semernoy, sp. n. (Fig. 10)

The length of a chain of 5 zooids is 1.2 mm, and the number of segments in the first zooid is 8.

There is no prostomium. The oral funnel is even and round along its outer margin. The integumental epithelium is ribbed (with narrow transverse ridges).

The esophagus is in segment IV and is very short and muscular.

The setae in all the segments are uniform in the shape of their distal end: they are bicuspid, with the upper tooth 2.5 times longer

The setae of the postlarval segments are bicuspid, with a thin, /37 rudimentary lower tooth, number 4 in each tuft and 83 to 100 μ long. Sexually mature worms each have 2 penial setae 70 μ long in segment VI, with an edentate hamately recurved distal end and a distal nodule.

The clitellum is in the form of a small egg cocoon enveloping part of segment V and all of segment VI.

An interesting feature of this species is the presence of uniformly shaped setae in the ventral tufts, and an unusually large number of them in the ventral tufts of the postlarval segments.

Chaetogaster gavrilovi Semernoy, sp. n. (Fig. 11)

The length of a chain of the individuals from two zooids is 0.6 mm, and the number of segments is 9.

The prostomium is clearly distinct and on its vertex has three rounded papillae, the middle one of which is longer. A distinct ventral position is typical of the mouth funnel.

The body surface is smooth, and there are no epidermal papillae. Segments II-VI are distended dorsally.

The setae are of two types: bicuspid in segment II, and edentate in the postlarval segments.

Segment II has in each tuft 4 setae 65 to 72 μ long, with the upper tooth thicker at the base, and 4 times longer, than the lower one. The ventral tufts of segments VI-IX each have 1 or 2 edentate setae 65 μ long, with a distal end hamately recurved at an angle of more than 90°.

Holotype No. 43367. Zoological Institute of the Academy of Sciences USSR.

Location. The southern end of Bol'shoi Ushkanii Island, depth 3 m, matter washed from stones, 15 July 1982.

Occurrence. The littoral of Bol'shoi Ushkanii Island.

The following serve as distinguishing features of the species;

a) the presence of a well-defined prostomium;

b) the shape of the distal end of the setae of segment II (the upper tooth is 4 times longer than the lower one);

c) the presence of edentate setae in the ventral tufts of segments V-VIII.

G.B. Gavrilov found worms with a similar set of setae in the Aral Sea /Gavrilov and Semernoi, 1974/.

In terms of morphological characteristics it is difficult to find points of similarity between this species and the ones previously described, or with the species from Lake Baikal. It probably belongs to the distinctive endemic fauna located off the Ushkanii Islands /Kozhov, 1962/.

Chaetogaster limnaei Boer.

Found by A.V. Yankovskii (Zoological Institute of the Academy of Sciences USSR) in the mantle cavity of a mollusk of the genus Baicalia. The worms have not been kept in our material. We performed identification using an MBS-1 binocular microscope mainly on the basis of an ecological feature: habitation in the mantle cavity, and possibly even the body cavity, of a mollusk, since the worms occurred in large quantity among the larvae of redia trematodes. The setal apparatus has not been studied. It has been indicated for Lake Baikal for the first time.

Thus in [Lake] Baikal investigators have found a remarkable diversity of forms of the genus Chaetogaster. Besides the new species described in this paper, our material also includes a number of forms of uncertain taxonomic position. In addition, the oligochaetes of the /38
littoral mesobenthos have not yet been studied over a considerable area of central and southern Lake Baikal. Collections of new material, and the further processing of material already available, will probably yield another series of unknown forms. An interesting fact to note is that the number of species of the genus Chaetogaster in Lake Baikal is double the known composition of the genus for the USSR and world fauna of the Oligochaeta. All species except Ch. diaphanus and Ch. limnaei may for the time being be considered to be endemic to [Lake] Baikal, including the Angara River. Species previously known for coastal Baikal water bodies /Malevich, 1950/ have not been found in open Lake Baikal.

The phylogenetic relations of the species are of interest. Bearing in mind the marked modificatory variability of the setal apparatus of Ch. diaphanus litoralis, we may assume that such species as Ch. paucus, Ch. grandisetosus, Ch. cannibalus, Ch. ignotus, Ch. crocodilus and Ch. multisetosus originated from Ch. diaphanus in the course of their adaptation to the conditions of the Baikal littoral by parallel evolution. Here we see the realization of all possible allelic states of bicuspid setae in different lines /Vavilov, 1933/. Another phylogenetic genus (Ch. dissetosus, Ch. intermedius and Ch. gavrilovi) apparently derived from Ch. langi, inhabiting the Lake Baikal region and probably Lake Baikal itself (forms closely resembling it have been found), also by parallel evolution, since in all of these species the prostomium is either visible or clearly defined, while the setae could have lost their lower teeth. Among the specimens of Ch. langi in our

collection from Central Asian water bodies the lower tooth is weakly developed and sometimes barely visible. A notable feature is the nanism of the [Lake] Baikal chaetogasters. Scientists have closely studied nanism and gigantism in [Lake] Baikal organisms /Bazikalova, 1948; Bekman, 1958; Votintsev, 1974/ and have explained these phenomena in different ways. We would surmise that the nanism of the chaetogasters is due primarily to their extreme position in a series of numerous predators on the Baikal littoral. Having no chance to compete with fishes and amphipods in predation, as Ch. diaphanus managed to do in the offshore zone of small water bodies, the [Lake] Baikal chaetogasters adapted to the microhabitat conditions, where they could feed on the simplest rhabdocoelids, small members of their own species, and rotifers. The remains of these animals have been observed in the intestines of many individuals. Among microhabitat conditions we include habitation in coarse-grained sand with pebbles, among coarse plant detritus, and in stonewort beds and tetraspore accumulations. Investigators have found the greatest diversity and abundance of chaetogasters in these biotopes, the chaetogasters having first been found as part of the interstitial fauna (Ch. crocodilus).

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